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Research Paper

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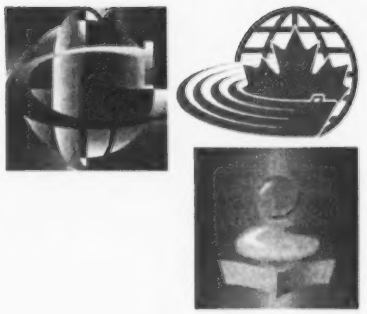
Expectations and Labour Market Outcomes of Doctoral Graduates from Canadian Universities



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Expectations and Labour Market Outcomes of Doctoral Graduates from Canadian Universities

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Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

Acronyms

The following acronyms are used in this publication:

CIP	Classification of Instructional Programs
NGS	National Graduates Survey
OECD	Organization for Economic Cooperation and Development
PSIS	Postsecondary Student Information System
SED	Survey of Earned Doctorates

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Section 1

Introduction

While doctoral graduates represent only a small proportion of the Canadian work force — 0.8% in 2006[1] – they have a significant impact on Canada's long term economic prosperity due to their contributions to innovation and productivity growth through research and educational activities. In 2005, about 4,200 candidates earned a doctorate degree in Canada[2]. This number is approximately one tenth the number awarded in the United States in the same year (43,400)[3].

Two general concerns have been raised regarding doctorates in Canada. The first is the number of graduates the system produces. The Organization for Economic Cooperation and Development (OECD) reports that Canada lags behind other developed countries in the production of doctoral degrees. In 2007, the rate of graduation from doctoral programs (labeled "advanced research programmes" by the OECD, or ISCED level 6) was 1.1% in Canada, compared to an OECD average of 1.4%[4]. However, this figure likely overstates what may be a weakness in the Canadian higher education system, since international comparisons rely on statistics reported by a large number of countries which may not always result in data that are fully comparable. Some analysts suggest that the graduation rate has some particularly problematic characteristics[5].

Among OECD countries, the number of doctorate graduates has increased dramatically in recent years. Auriol (2010), in an OECD project on doctorate holders,[6] notes that 200,000 doctoral degrees were awarded in 2006 across OECD countries compared to 140,000 in 1998, representing a 40% increase in 8 years. This is in contrast to Canada, which saw 4,500 doctorate degrees awarded in 2006, compared to 4,000 in 1998, an increase of just 13%. However, numbers have increased more steeply in recent years. In 2008, for example, 5,400 doctorates degrees were awarded for an increase of 40% from 5 years earlier[7].

Related to how many graduates are produced is the issue of where they will live and work once their education is complete. Previous research has shown that over one fifth of doctoral graduates plan to live outside of Canada upon completion of their degree (Boothby, 2008; also King, Eisl-Culkin and Desjardins, 2008). Most students planned to move to the United States, many of these in order to complete postdoctoral studies. While this represents a significant loss in human capital from the Canadian economy, the problem may be overstated since the majority of leaving graduates (55%) also indicated that they planned to return to Canada to live and work in the future. In this paper, we show that two years following graduation, 24% of leavers had returned to Canada after spending some time in the United States, while the majority still in the United States continued to have intentions of returning.

A second concern is over how doctorate holders are employed in the economy. The Canadian Counsel of Academies notes that Canada's level of human capital is among the highest in the world, but fewer doctorates in Canada are employed by the private sector than in many other countries. They attribute this difference to lower business demand for advanced research skills and lower private investment in advanced research compared to the United States.[8]

King, Eisl-Culkin and Desjardins (2008) also document the lower private sector employment rates of doctorate holders in Canada. They show that fewer Canadian doctoral graduates in 2005/2006 were expecting to be employed by industry than were American graduates, by about 5 percentage points. Instead, Canadian graduates were more likely to be employed by governments. While this type of comparisons to the United States is not available for this paper, we do find that most graduates are employed in a small number of industries, the largest being educational services.

The remainder of this report is organized as follows. Section two describes the data on which this report is based and discusses the advantages of using a linked data source. Section three describes the National Graduates Survey class of 2005 in terms of graduates' demographics and program characteristics. Section four examines mobility patterns, with a particular focus on graduates who move to the United States. Section five examines graduates' labour market outcomes, including employment rates, income, industry and the prevalence of overqualification. The final section provides some concluding remarks.

Section 2

The data

This report provides an opportunity to examine the outcomes of graduates more thoroughly by drawing from two different data sources that survey similar populations, but at two different points in time. The first is the Survey of Earned Doctorates (SED), which has provided annual data on doctoral graduates at the point of graduation since the 2003/2004 academic year. The second source is the National Graduates Survey (NGS), which interviews a representative sample of graduates from Canadian post-secondary education institutions two years after their graduation. The survey has been administered at four- or five-year intervals since 1982. Thus, doctoral graduates in 2005 were interviewed at the time of graduation by SED and again in 2007 by the NGS. Due to the relatively small number of doctoral graduates, both surveys are a census of doctoral graduates in Canada.[9]

Since SED is collected based on the academic year (from the beginning of July to the end of June of the following year) and the NGS data are collected for the calendar year, two waves of SED were merged to capture all graduates from the 2005 calendar year. These two classes have been described previously—2004/2005 graduates in King (2008) and 2005/2006 graduates in King, Eisl-Culkin and Desjardins (2008). The class of 2005 from the NGS has been described in Bayard and Greenlee (2009).

Non-response to the two surveys (approximately 46% for SED and 33% for the NGS) resulted in a total sample of approximately 2,500 graduates who responded to both surveys. These respondents were then weighted to represent the graduating class of 2005. In instances where the linked file did not add value to the analysis, statistics were computed with either the full SED or NGS sample in order to preserve sample size. It should be noted that SED is representative of all graduates from Canadian institutions, while the NGS and the NGS-SED linked files are representative only of graduates who remained in Canada or the United States after completion of their degrees. However, this difference did not lead to sizeable differences in key indicators between the samples (see Box1).

Box 1: Target population of the National Graduates Survey

The target population for the 2005 NGS consisted of all graduates from a recognized public post-secondary Canadian institution who completed the requirements of an admissible program or obtained a diploma some time in 2005 and who were living in Canada or the United States at the time of the survey (with the exception of American citizens living in the United States at the time of the survey).

In-scope records are records that met all criteria in the target population as defined above. Of the 4,200 doctoral graduates in Canada in 2005, about 3,500 were considered to be in-scope graduates in 2007[10].

Overall, there were no differences in the distribution of women between the two populations; 44% of graduates in 2005 were women compared to 46% in 2007. Similarly, the distribution of graduates by different fields of study was comparable, except in the social and behavioural sciences, and law where the share of graduates increased by three percentage points, from 18% to 21%.

Note: Comparisons between 2005 and 2007 were made by comparing the NGS data to data from the Postsecondary Student Information System (PSIS).

2.1 Linking the SED and the NGS

Both the SED and the NGS each have their strengths and limitations for examining doctoral graduates. For instance, since SED is conducted at the time of graduation, it contains limited information regarding employment outcomes. In fact, employment data in SED relies on the graduates' own expectations for their future employment, if they had already made plans for employment or further education. On the other hand, because SED is collected at the time of graduation, it surveys all graduates regardless of where they will be living upon completion. This is in contrast to the NGS, which, for practical purposes, includes only graduates who are living in Canada or the United States at the time of the interview. Both surveys include only recipients of a doctorate degree from Canadian institutions and not doctorate holders who immigrated to Canada. According to the 2006 Census, graduates from Canadian institutions accounted for just over half (54%) of all doctorate degree holders in Canada.

Linking the two data sources provides a unique and valuable source of data on this population beyond what is generally known from these two sources alone. The linked file creates a longitudinal data file covering doctoral graduates who graduated in 2005 and who lived in Canada or the United States in 2007. Graduates' expectations and plans at the time of graduation can be verified with data collected two years following their first interview. Furthermore, the accuracy of their expectations can be assessed, giving us a picture of the outcomes of their degrees as well as an insight into the reliability of graduates' expectations as captured by SED. Additionally, information that was collected in SED may be used to add explanatory power to the outcomes found in the NGS.

For simplicity and occasionally to meet conditions of confidentiality, the fields of study have been collapsed in order to provide larger samples. The fields were collapsed as follows:

Table 1

Comparison of detailed field of study and Classification of Instructional Programs (CIP) to collapsed list

Collapsed list	Detailed field of study list	Classification of Instructional Programs (CIP) series and subseries
Life sciences	Agricultural sciences Biological sciences Health sciences	Agriculture, natural resources and conservation Biological and biomedical sciences, natural sciences All health sciences – including nutrition sciences and neurosciences
Engineering	Engineering	Engineering
Computer, mathematics and physical sciences	Computer and information sciences and mathematics Physical sciences – including astronomy and astrophysics, atmospheric sciences and meteorology, chemistry, geological and earth sciences / geosciences, physics	Mathematics, computer and information sciences Physical sciences – including astronomy and astrophysics, atmospheric sciences and meteorology, chemistry, geological and earth sciences / geosciences, physics
Psychology and social sciences	Psychology Social sciences	Social sciences Psychology Behavioural sciences
Humanities	History Letters, languages and literature Other humanities	History Letters, languages, literatures and linguistics Liberal arts, general studies and humanities Philosophy and religious studies
Education and other fields of study	Education Professional fields / other fields	Education Business, management and public administration Architecture Communication, journalism and related and library science Law Parks, recreation, leisure and fitness Other multidisciplinary studies

Note: Not all Classification of Instructional Programs (CIP) series and subseries are represented at the doctoral level.

Section 3

Profile of 2005 doctoral degree graduates two years after graduation

Two years after graduation, about 3,500 graduates from doctoral programs from the class of 2005 were living in Canada or the United States, representing 83% of the 4,200 doctorate graduates from Canadian universities in 2005.

Almost three out of ten doctoral recipients graduated in life sciences

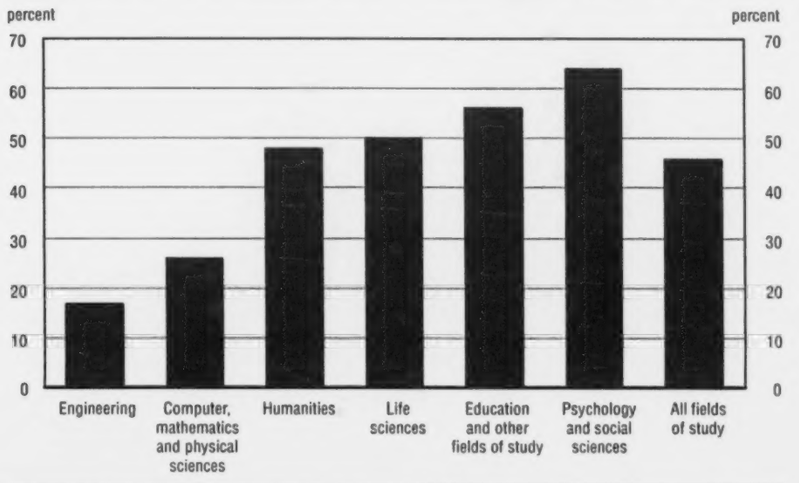
Two fields of study accounted for nearly half of all 2005 doctoral graduates who lived in Canada or the United States in 2007: 29% graduated from life sciences programs and 19% from psychology and social sciences programs. The proportion of doctoral graduates in the four other fields of study varied between 12% and 14% (Appendix table A.1).

Six out of ten women graduated from the life sciences and psychology and social sciences

Women accounted for 46% of doctoral graduates in the class of 2005; an increase of 11 percentage points compared to their proportion in the class of 1995, which stood at 35%[11].

The difference between the proportion of female and male graduates was highest in engineering, where for every female (17%) there were almost five male graduates (83%), as well as in computer, mathematics and physical sciences, where the proportion of men (74%) was close to three times that of women (26%). Women made up the majority of graduates in two fields of study, namely, psychology and social sciences (64%) and education and other fields of study (56%). The proportion of women was comparable to that of men in life sciences (50%) as well as in the humanities (52% versus 48%) (Chart 1).

Chart 1
Proportion of 2005 women doctoral graduates by field of study



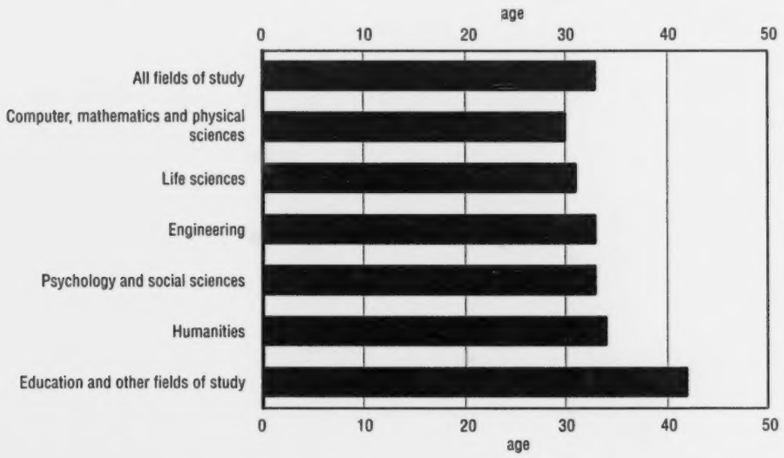
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Moreover, about six women out of ten (59%) graduated from two fields of study, namely the life sciences (32%) and psychology and social sciences (27%). While life sciences also posted the highest share of men (27%), this proportion was lower than that of women and was followed by engineering (21%) and computer, mathematics and physical sciences (17%).

Although the median age of doctoral graduates was 33 years at the time of graduation in 2005, graduates in education and other fields of study reported the oldest median age at 42 years. These graduates were also much older at the start of their doctoral program; 36 years compared to an overall median age of 27. The relatively high age of these graduates at registration can be explained by the fact that most of them were out of the educational system during the twelve months before enrolling in their program. Indeed, seven out of ten graduates from education and the professional fields (70%) were in the labour force compared to 45% for all graduates combined (Appendix table A.5). Furthermore, they were also less likely to have taken their program full-time (56%) compared to all graduates combined (80%). Apart from education and other fields of study, there were no substantial differences in the age at the time of registration between the fields of study.

Conversely, the lowest median age at graduation was found in life sciences (31 years) and in computer, mathematics and physical sciences (30 years) (Chart 2).

Chart 2
Median age at graduation for 2005 doctoral graduates by field of study



Note: Excludes respondents for whom the age is unknown.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Chinese languages were the third largest mother tongue group

Since Canadian universities deliver their programs in either English or French and since the pursuit of a doctoral program requires very high level literacy skills, it is worth exploring the literacy profiles of doctoral graduates by examining the first language learned at home in childhood and still understood by the graduates; that is, their mother tongue.

About two-thirds of doctoral graduates (67%) reported English or French as their mother tongue (47% and 20% respectively). Another 30% had a mother tongue other than English or French; an additional 1% had learned and still understood both English and French; and finally, 2% had learned and still understood English or French along with a non-official language. After English and French, Chinese languages[12] were the third largest group, as 8% of doctoral degree holders reported a Chinese language as their mother tongue. This percentage is more than twice the proportion reported in the general Canadian population (3%).[13] Furthermore, Chinese speakers accounted for more than one-quarter (27%) of doctoral graduates whose mother tongue was a non-official language. In addition, the vast majority of Chinese speakers (81%) as well as other non-official language speakers (87%) lived in Canada in 2007.

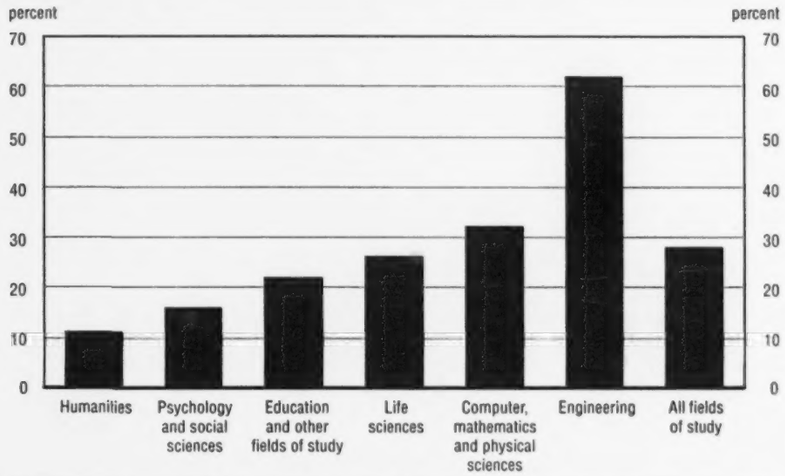
The proportion of graduates with a non-official language mother tongue varied greatly across fields of study. Almost two-thirds of engineering graduates (64%) as well as close to four out of ten graduates in computer, mathematics and physical sciences (37%) had a non-official language as their mother tongue. Conversely, 20% of graduates in psychology and social sciences and about 17%

graduates in humanities reported a non-official language as their mother tongue (Appendix table A.2).

More than six out of ten engineering graduates were members of a visible minority group

Overall, 28% of doctorate graduates reported being members of a visible monority group and this proportion varied by field of study. The proportion of graduates who reported being a member of a visible minority group was higher in engineering (62%) and computer, mathematics and physical sciences (32%). On the other hand, the proportion was lower in psychology and social sciences (16%) as well as the humanities (11%, Chart 3).

Chart 3
Proportion of 2005 doctoral graduates members of a visible minority group, by field of study



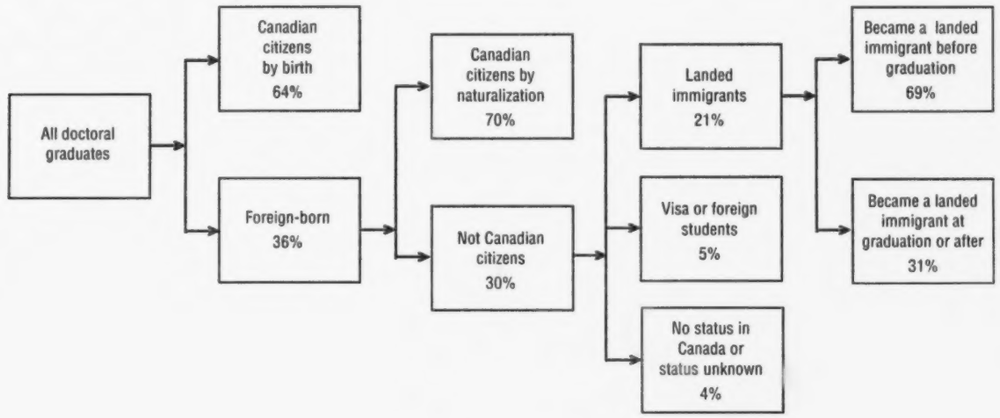
Note: Only includes respondents who indicated whether or not they identified themselves as members of a visible minority ethnic or racial group.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

The vast majority of 2005 foreign-born doctoral graduates were naturalized of became landed immigrants by 2007

Results for engineering and computer, mathematics and physical sciences can be attributed to the fact that a high proportion of graduates in these fields of study were born outside Canada. Indeed, close to three-quarters of engineering doctoral recipients (74%) and 44% of graduates in computer, mathematics and physical sciences were born outside Canada, compared to 36% for all fields of study combined. However, the vast majority of 2005 foreign-born[14] graduates who were living in Canada or the United States two years after graduation (91%) were

naturalized or became a landed immigrant by the time of the interview in 2007 (Appendix table A.3). As shown in Figure 1, more than two-thirds of immigrant graduates became landed immigrants before graduating from their doctoral program in 2005.

Figure 1
Citizenship status in 2007 of 2005 doctoral graduates


All doctoral graduates
Canadian citizens by birth 64%
Foreign-born 36%
Canadian citizens by naturalization 70%
Not Canadian citizens 30%
Landed immigrants 21%
Visa or foreign students 5%
No status in Canada or status unknown 4%
Became a landed immigrant before graduation 69%
Became a landed immigrant at graduation or after 31%

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Half of doctoral graduates had a parent whose education was at least a bachelor degree

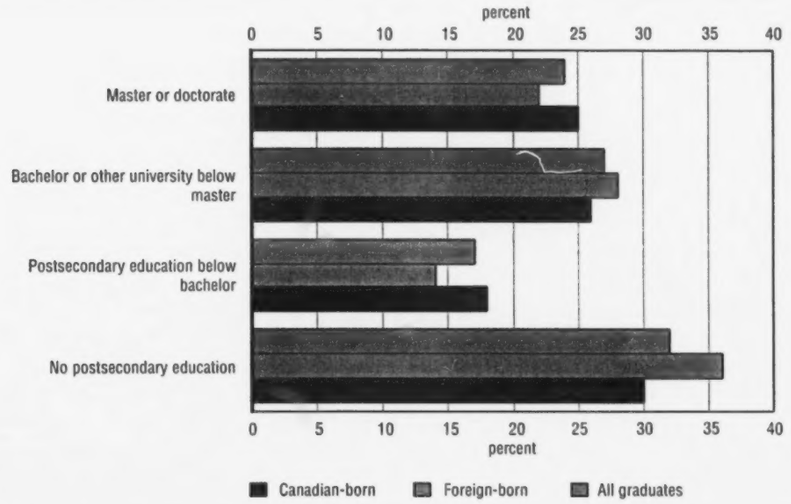
Previous studies have suggested that higher parental education results in higher education levels in children. More specifically, it showed that the type of postsecondary education pursued by young Canadians was strongly associated with parents' educational attainment. Young people whose parents had a university degree were three times more likely to pursue university studies than were those whose parents had a high school diploma or less.[15]

Moreover, a study of doctoral graduates in the United States showed that doctorate recipients who were American citizen were more likely than their non-citizen counterparts to report that at least one of their parents attained at least a bachelor degree.[16]

As shown in Chart 4, half of Canadian doctoral graduates had a parent whose highest level of education was at least a bachelor degree. There was no difference between the proportion of Canadian-born (51%) and foreign-born graduates (50%) who reported that at least one of their parents attained such a degree. In contrast, there were differences between Canadian and foreign born graduates among those whose parents did not have at least a bachelor degree. Foreign-born students were

more likely to have parents who had not pursued post-secondary education (36% versus 30% for Canadian born) whereas Canadian-born students were more likely to have parents who had completed post-secondary education below the bachelor level (18 % compared to 14% for foreign-born (Chart 4). These differences may be explained by differences in the structure of educational systems within Canada compared to other countries.

Chart 4
Highest level of parental education, 2005 Canadian and foreign-born doctoral graduates



Source: Statistics Canada, National Graduates Survey (Class of 2005).

Two graduates out of ten did not hold a master's degree before they started their doctoral program

Not all doctoral graduates had completed a master's degree before enrolling in their program, nor do all doctoral programs require a master's degree for admission. In fact, according to the Survey of Earned Doctorates, about seven graduates out of ten (69%) reported that a master's degree was a prerequisite for admission to their doctoral program.[17] Graduates in the life sciences (50%) as well as those in computer, mathematics and physical sciences (57%) reported in significantly lower proportions than the overall rate that entry into their program required a master's degree.

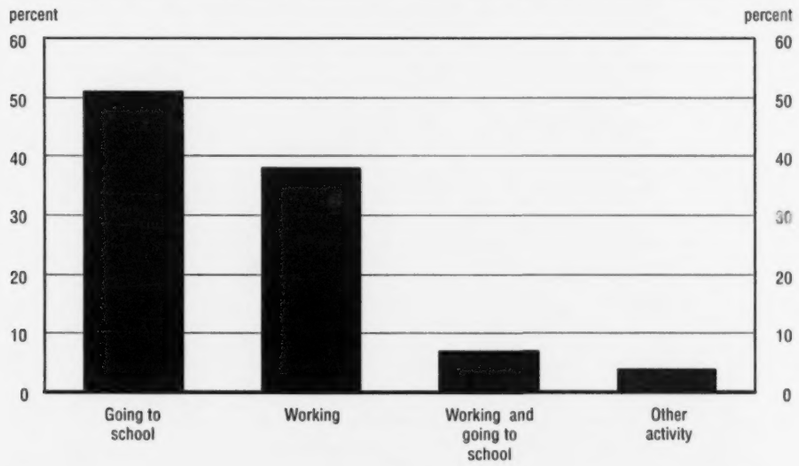
Similarly, these same graduates reported the lowest rates of master's attainment at 63% and 73% respectively. Graduates in the humanities posted the highest rate of master's attainment (95%) while the overall rate was 80%. Moreover, a similar proportion of graduates in the humanities (93%) reported that they needed a master's degree to be admitted to their doctoral program (Appendix table A.4.1).

Typically, a median time of four months elapsed between the completion of a master's degree and the start of the doctoral program. However, for graduates who held a master's degree and were working during the twelve months prior to enrolling in their doctoral program, the median elapsed time between the completion of the master's degree and the start of the doctoral studies was three years and two months (Appendix table A.4.2).

Almost four out of ten graduates were working before entering their program

About half (51%) of all 2005 doctoral graduates were in school in the year prior to enrolling in their doctoral program. Almost four out of ten graduates (38%) were working, whereas 7% were combining working and going to school (Chart 5). The highest proportions of graduates to have been in school 12 months before the start of their doctoral program were those in computer, mathematics and physical sciences (64%). They were followed by graduates in psychology and social sciences (58%), life sciences (54%) and the humanities (54%). Conversely, seven out of ten graduates in education and other fields of study were either working (60%) or combining work and school (10%) (Appendix table A.5).

Chart 5
Main activity of 2005 doctoral graduates 12 months prior enrolment in program



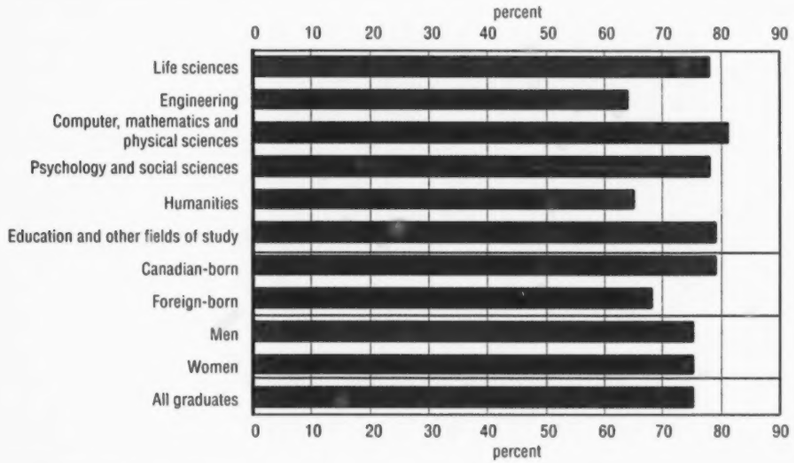
Note: Other activity includes: taking care of family or household responsibility, without work and looking for work and other.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

More than three-quarters of graduates had firm plans at the time of graduation

Upon graduation, doctoral recipients may have firm plans to enter the labour market; to continue their research; to pursue further studies or other activities; or they may still be undecided. At the time of graduation in 2005, three-quarters of doctoral graduates had made firm plans for either employment or postdoctoral studies or training for the year following their graduation.

There was no difference in the proportion of women with definite commitments compared to male graduates (75%). The proportion of graduates with definite plans upon graduation was comparable across all fields of study, ranging from 77% to 82%, except for engineering and the humanities, both at about 65%. Furthermore, Canadian-born graduates (79%) were more likely than their foreign-born counterparts (68%) to have definite plans at the time of graduation for the following year (Chart 6).

Chart 6
Proportion of 2005 doctoral graduates with definite plans at graduation



Sources: National Graduates Survey (Class of 2005) and Survey of Earned Doctorates, 2004/2005 and 2005/2006 linked file.

More than half the graduates with firm plans (56%) expected to join the labour market upon graduation. Proportionally more women graduates (61%) than men (52%) had plans for employment, whereas about half the men (48%) were planning to pursue a postdoctoral fellowship or other training (see box 2 for a definition of postdoctoral fellowship).

In addition, there were marked differences in the type of definite plans across fields of study. Almost all graduates in education and other fields (93%) were planning to work immediately upon receiving their degree. These were followed by graduates in humanities (76%) and psychology and social sciences (70%).

Conversely, about two-thirds of life sciences graduates (69%), as well as computer, mathematics and physical sciences graduates (64%) had plans for postdoctoral studies or research when they graduated in 2005. Foreign-born and Canadian-born graduates had definite plans for postdoctoral studies in comparable proportions (at 49% and 41%, respectively) (Appendix table A.6).

Box 2: Postdoctoral positions

The Survey of Earned Doctorates defines a "postdoctoral position" or a "postdoc" as a **temporary position** primarily for gaining additional education and training in research, usually in academia, industry, or government.

In Canada, individuals who contract with a university (and sometimes a specific faculty member) to conduct academic or scholarly research that will further professional development and expand their expertise in a specialized subject are usually referred to as "Postdoctoral Fellows" or "Postdoctoral Research Associates". They are considered trainees rather than employees by the university or research institution.

Their appointment normally occurs within five years from the completion of a doctoral degree and is time limited (often to a maximum of three years), with the possibility of renewal. The postdoctoral researcher may be funded through a salary, a stipend or sponsorship award. The amount of the fellowship typically varies between $25,000 to $50,000 depending on the field of research, the funding agency and the research institution.

Source: Information gathered from diverse Canadian universities' web site.

Section 4

Graduates who moved to the United States

Canada, like most industrialized countries, is faced with an aging population and an expected shortage of skilled workers in some professions. Thus, a possible exodus of highly-educated workers or the threat of a "brain drain" not only out of the country, but also out of the labour market remains an important policy issue.

As previous studies have shown, about one fifth of the 2005 doctoral graduates (21%) intended to leave Canada upon completion of their degree and most of them (57%)[18] planned to move to the United States. This section looks at the characteristics of doctoral graduates from Canadian universities who lived in the United States at the time of the National Graduates Survey (NGS) interview in 2007.

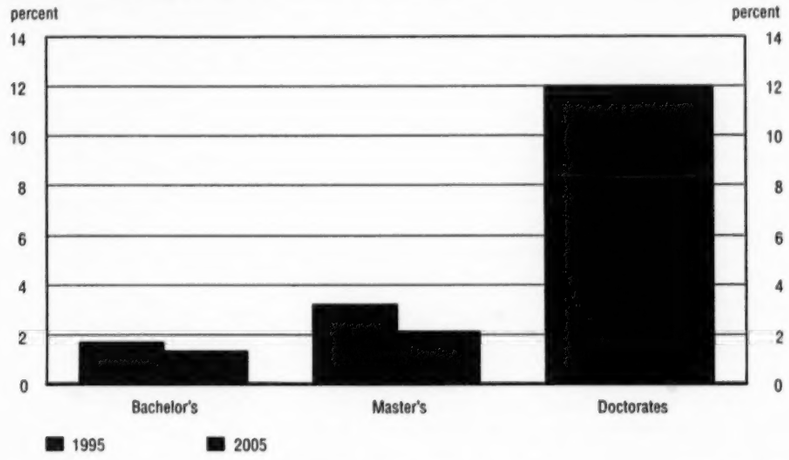
A much higher proportion of doctoral graduates lived in the United States in 2007 than was the case for graduates at the bachelor and master's levels

Slightly more than one out of ten 2005 doctoral graduates (12%) were living in the United States in 2007. This proportion is identical to that of the doctoral graduates of the Class of 1995 who were living south of the border two years after graduation, in 1997[19]. Another 4% had moved to the United States after graduation but had returned to Canada by 2007 (Appendix table A.7). The 2007 "returnees" accounted for 24% of those who had moved south of the border after graduation.[20]

In comparison, the proportions of 2005 graduates at the bachelor and the master's levels who lived in the United States in 2007 were significantly lower at 1.3% and 2.1% respectively. These percentages are similar to those in 1997 for the graduating class of 1995 which posted proportions of 1.7% and 3.2%, respectively (Chart 7).

Chart 7

University graduates who lived in the United States two years after graduation, 1995 and 2005 graduates



Sources: Statistics Canada, National Graduates Survey (Class of 2005) and Frank, Jeff and Éric Bélair. 1999. *South of the border: Graduates from the Class of '95 Who Moved to the United States*, Statistics Canada Catalog no. 81-587-XPB. Ottawa. Statistics Canada and Human Resources Development Canada. 41 p.

About six out of ten doctoral graduates living in the United States in 2007 were Canadian citizens by birth

Of the doctoral graduates from Canadian universities who were living in the United States in 2007, about two-thirds (63%) were males and almost one-third (30%) were single. In contrast, significantly fewer graduates who lived in Canada in 2007 were men (53%) or single (22%).

Graduates who lived south of the border were also significantly younger (30 years old) than those who lived in Canada (33 years old) and almost nine out of ten (87%) were Canadian citizens, of which 59% were Canadian by birth and 28% by naturalization. These proportions are comparable to those of graduates who were living in Canada in 2007, namely 90% (65% by birth and 25% by naturalization).

Life sciences and computer, mathematics and physical sciences graduates posted the highest proportions of doctoral graduates who left Canada for the United States

A higher proportion of 2005 graduates from two fields of study were living in the United States in 2007 compared to the overall proportion who left Canada. Specifically, almost one in five graduates from the life sciences (17%) — which include agricultural sciences, biological sciences and health sciences – and a same

proportion from computer, mathematics and physical sciences (17%) were living in the United states in 2007, compared to 12% of doctoral graduates overall (Appendix tables A.7, A.8.1 and A.8.2).

As shown in Table 2 below, two detailed fields of study contributed the most to these results. About one third of graduates in biochemistry, biophysics and molecular biology (34%) were living in the United States in 2007, which is twice the proportion for all life sciences doctoral graduates. Among graduates from computer, mathematics and physical sciences, graduates in physics posted the highest proportion (28%) of graduates living south of the border.

Doctoral graduates in the health professions and related clinical sciences, on the other hand, were less likely to have left Canada, at 10% (Table 2). These rates were lowest for doctoral graduates in psychology and the social sciences as well as in education and other fields of study (each at about 6%) (Appendix tables A.8.1 and A.8.2).

Table 2

Proportion of doctoral graduates in life sciences and computer, mathematics and physical sciences who lived in the United States in 2007

	Proportion	Confidence limits (95%)	
		Lower	Upper
	percent		
Graduates in life sciences			
Biology, general	23	17	29
Biochemistry, biophysics and molecular biology	34	27	41
Plant biology, cellular biology, microbiological sciences and immunology	13	9	17
Genetics, physiology and related sciences	23 E	15	31
Other biological and biomedical sciences	19 E	13	25
Health professions and related clinical sciences	10	7	13
Other life sciences	22	17	27
All life sciences graduates	**17**	**15**	**19**
Graduates in computer, mathematics and physical sciences			
Computer and information sciences	19 E	12	26
Mathematics and statistics	14 E	8	20
Chemistry	18	13	23
Physics	28	20	36
Other physical sciences	x	...	...
All computer, mathematics and physical sciences graduates	**17**	**14**	**20**

... not applicable
x suppressed to meet the confidentiality requirements of the *Statistics Act*
E use with caution

Source: Statistics Canada, National Graduates Survey (Class of 2005).

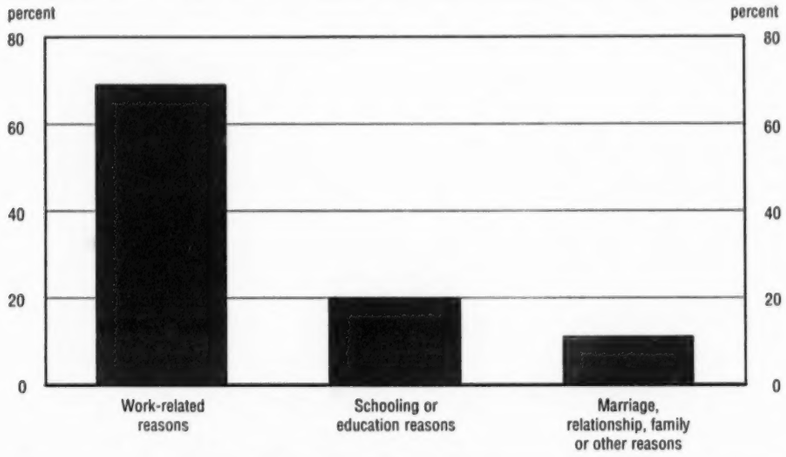
Most moved for work-related reasons and a majority were attracted by the quality of research facilities or the commitment to research

About seven out of ten graduates who lived in the United States in 2007 (69%) moved for work-related reasons. Schooling or education-related reasons were reported by 20% of the movers, while one out of ten graduates moved for personal

reasons such as marriage, relationship, and family or other reasons. No significant differences in reasons for moving were observed when fields of study or gender were examined.

Chart 8

Reasons why graduates moved to the United States



Source: Statistics Canada, National Graduates Survey (Class of 2005).

Quality of the research facilities or the commitment to research was the most commonly-cited factor attracting graduates to the United States. This incentive was reported by a third of graduates, whether they moved for educational (33%) or job-related reasons (35%). Two other frequent job-related reasons for moving to the United States were a greater availability of job in a particular / specialized field or industry (27%) and better career advancement opportunities (24%). Women and men were equally attracted by these three aspects of the job.

Other common educational reasons for moving to the United Sates were the high academic reputation of the program or institution (29%) and the desire to study with particular colleagues or superiors (26%)[21] (Appendix tables A.9.1 and A.9.2).

The vast majority of those who moved for educational reasons intended to take a postdoctoral position after their graduation in 2005

It is interesting to note that more than eight out of ten returnees (84%), i.e. those who moved to the United States after graduation but were living in Canada in 2007, had planned to take a postdoctoral position after their graduation in 2005. Furthermore, the vast majority (95%) of graduates living in the United States in 2007 who had moved for educational reasons had intended to take a postdoctoral position at the time of graduation in 2005[22]. This is in sharp contrast with graduates

who never moved to the United States after graduation. Indeed, less than half of the latter group (46%) had plans to be in a postdoctoral position following graduation (Table 3). While the National Graduates Survey does not indicate whether or not graduates who moved to the United States were in fact pursuing postdoctoral studies in 2007, these results suggest that the majority of them likely moved to take a postdoctoral position.

Table 3

Proportion of non-movers, movers and returnees who intended to take a postdoctoral position at the time of graduation

		Confidence limits (95%)	
	Proportion	Lower	Upper
		percent	
Never lived in the United States after graduation	46	44	48
Lived in the United States in 2007	72	65	79
Moved for work-related reasons	68	59	77
Moved for educational reasons	95	87	100
Moved to the United States after graduation but lived in Canada in 2007	84	77	91

Sources: Statistics Canada, National Graduates Survey (Class of 2005) and Survey of Earned Doctorates, 2004/2005 and 2005/2006 linked file.

A job awaited the doctorate graduates who moved to the United States

In addition, nine out of ten graduates who moved to the United States had a job arranged to start right away upon their arrival whether they moved for job or education related reasons. Almost all movers from the fields of computer, mathematics and physical sciences (98%) and life sciences (95%) had a job waiting for them south of the border. In contrast, slightly less than 68% of those who moved to the United States from the education and other fields of study had a job upon arrival (Appendix table A.10).

Furthermore, nine out of ten doctoral graduates living in the United States (92%) were employed in the 2007 survey reference week. This proportion was comparable to the proportion of graduates who were living in Canada in 2007 and who were employed (89%). However, proportionally more male graduates living in the United States were employed compared to their counterparts who were living in Canada, while the proportions were comparable for women. Likewise, the only field of study posting a significant difference between the two groups of graduates was the life sciences: 94% of graduates living in the United States were employed compared to 87% of those living in Canada (Appendix table A.11).

Almost half of the graduates who lived in the United States in 2007 had first moved to three states: California (21%), Massachusetts (14%) and New York (12%).

Whereas only 5% of movers were permanent residents upon their arrival in the United States, this proportion had reached 12% in 2007, an increase of seven percentage points. Of the 84% who were temporary residents in 2007, about a quarter (27%) were planning to become permanent residents in the United States within the next two years (Table 4).

Table 4
Status of graduates upon arrival in the United States and in 2007

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
Status upon arrival[1]			
Temporary resident (includes students)	92	90	94
Permanent resident	5 [E]	3	7
American citizen	3 [E]	1	5
Status in 2007[1]			
Temporary resident (includes students)	84	81	87
Permanent resident	12	9	15
American citizen	4 [E]	2	6
2007 temporary residents who planned to become permanent resident within 2 years			
Both sexes	**27**	**23**	**31**
Men	23	18	28
Women	35	28	42

[E] use with caution

1. Percentages may not sum up to 100 due to rounding.

Source: Statistics Canada, National Graduates Survey (Class of 2005).

A majority of movers intended to return to Canada

More than eight out of ten graduates living in the United States in 2007 (83%) intended to return to Canada. This was the case for all doctoral graduates in engineering (100%) and for the great majority of those in the humanities (95%), with most (83%) of them were planning to return within five years or less (Appendix table A.12).

Section 5

Graduates' labour market outcomes

This section examines employment rates, incomes and occupations of doctoral graduates, two years after graduation. Since this information is drawn from the National Graduates Survey, it refers to graduates who were still in North America in 2007, rather than to all graduates of 2005. Those still in Canada or the United States in 2007 accounted for 83% of the graduating class of 2005.

Employment rates varied by field of study

By 2007, four graduates out of five were employed workers, with an additional five percent being self employed, and six percent being unemployed. Eight percent of graduates were out of the labour force, with the majority (about 5%) reporting that they were still in education. When these graduates were excluded, the unemployment rate increased to 7% for all graduates, though this varied considerably across fields of study. Graduates from the humanities reported an unemployment rate of 16%, which was twice as high as the next highest field, engineering at 8% (Appendix tables A.13 and A.14).

Rates of part-time employment were also quite high for certain fields of study. Excluding current students, 8% of employed graduates were in part-time employment (Appendix table A.15). The rate of part-time employment was lowest for engineering graduates at 2% and highest for humanities at 18%.

The median income for doctoral graduates in 2007, two years after graduation, was $65,000

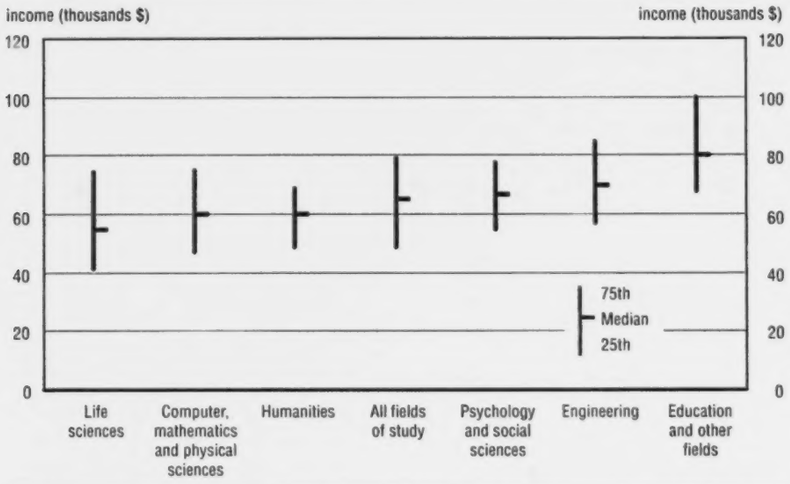
The median income for all graduates was $65,000, while graduates at the 25th percentile were paid $48,387 and those at the 75th percentile were paid $79,000 (Chart 9).

Graduates' incomes also showed considerable variation across fields of study (Chart 9). Graduates of the life sciences had the lowest median income in 2007 at $55,000 and also the lowest 25th percentile income at $41,500. This is in contrast to findings from the Survey of Earned Doctorates that examined graduates expected income where in 2004/2005 and 2005/2006, graduates of the humanities expected the lowest incomes. Measured in 2007, humanities graduates had a median income of $60,000, placing it on par with graduates from computer, mathematics, and physical sciences graduates, performing better than what they expected at the time of graduation. However, humanities graduates had the lowest income reported at the 75th percentile ($69,000). The highest incomes were reported by graduates

of programs in education and other fields of study ($80,000). Part of this earnings advantage may reflect prior work experience, as education doctoral graduates had the highest median age at graduation across all fields of study.

Chart 9

Income of graduates at the 25th, 50th and 75th percentiles, by field of study



Note: Excludes unpaid workers, respondents still taking education credits and those currently outside the labour force in 2007.

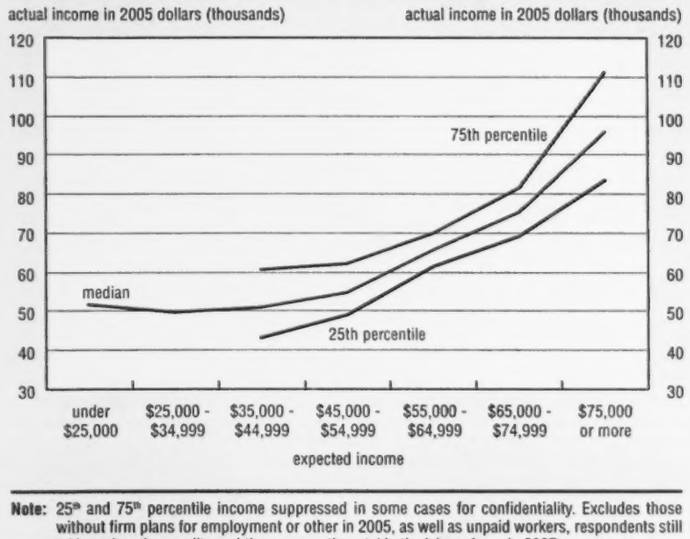
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Box 3: How well does expected income predict actual income?

As previously mentioned, linking SED and NGS data provides an opportunity to examine the usefulness of certain measures captured in SED. Given that in SED graduates were only just entering the labour market, outcomes were approximated by asking what their expected income was if they had firm plans for employment. Lining these expectations up to actual income in 2007 (displayed here in 2005 dollars) reveals that, particularly in the lower ranges, graduates' expectations were considerably below the median earnings reported two years later (Chart 10). Above an expected income range of $35,000 to $44,000, expected incomes seem to reasonably approximate actual median income, after accounting for some growth in income over the two years between SED and NGS.

Chart 10

Expected and actual income of graduates who reported an expected income in 2005 and who were employed in 2007



Note: 25th and 75th percentile income suppressed in some cases for confidentiality. Excludes those without firm plans for employment or other in 2005, as well as unpaid workers, respondents still taking education credits and those currently outside the labour force in 2007.

Sources: Statistics Canada, National Graduates Survey (Class of 2005) and Survey of Earned Doctorates, 2004/2005 and 2005/2006 linked file.

There were differences in income between men and women, immigrants and Canadian-born

Income differences were also noted between men and women and between immigrants and Canadians by birth. Across all fields of study, men were paid a median income of $65,000 compared to $61,000 for women. The difference was largest in education and other fields of study as well as in the life sciences, where the difference in median income was about $8,000. While in education and other fields, the men were paid more than the women, in the life sciences it was the women who earned more than men, $57,000 versus $49,462. Psychology and social sciences was the only other field for which there was a significant difference, namely $7,000. It is unclear how much of the difference may be due to more specific field of study choices within these aggregate categories.

On the other hand, the median income was comparable between the genders in engineering, in computer, mathematics and physical sciences as well as in the humanities (Appendix table A.16).

Canadian-born graduates earned a median income of $64,000 in 2007 compared to $60,000 for foreign-born graduates. Significant differences were also observed among humanities graduates and graduates from education and other fields of study where Canadian-born graduates earned about $5,000 more than their foreign-born counterparts (Appendix table A.17).

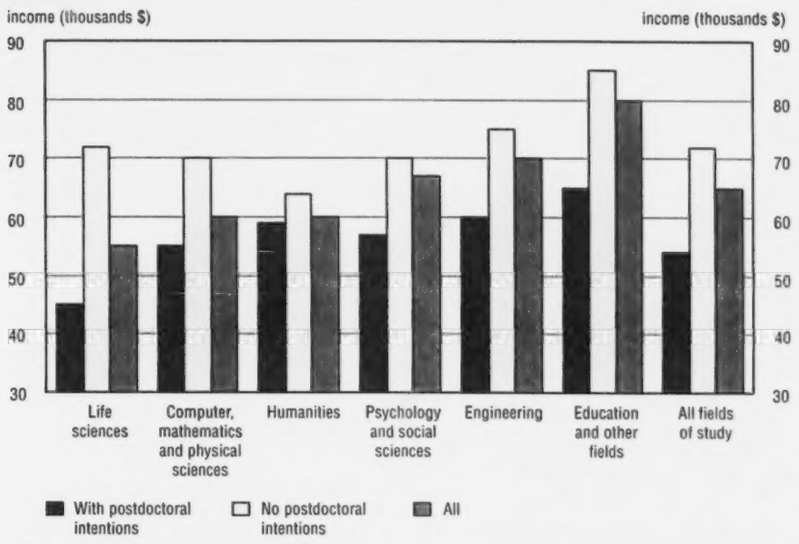
Graduates with postdoctoral intentions earned less in 2007 than those without

The linked NGS-SED file adds some additional explanatory power in examining graduates' incomes. Bayard and Greenlee (2010) in their examination of graduate outcomes, note that doctoral graduates' earnings were not that different from those with a master's degree, despite a significant additional investment in learning by doctoral graduates. For men, both master's and doctoral graduates earned a median income of $65,000, while for women; doctoral graduates earned $5,000 more than master's graduates.[23] However, using the NGS data alone does not allow the identification of doctoral graduates who were in a postdoctoral position in 2007. Though graduates were asked to indicate if they were still in the educational system or if they were employed, postdoctoral work might best be described as somewhere in between the two.

SED asks two questions regarding postdoctoral education. The first, posed only to graduates who have already made firm plans, asks if the employment or education they will be undertaking is a postdoctoral position. The second is posed to all graduates and asks if they intended to do a postdoctoral degree. Neither is a perfect measure of graduates' activities between 2005 and 2007, but they do reveal an important distinction between graduates (Chart 11). Whereas the median income of all graduates in 2007 was $65,000, those with postdoctoral intentions had a median income of $54,000, while those without had a median income of $72,000; an earning gap of $18,000. The difference was largest in the life sciences, where graduates who intended to take a postdoctoral position earned a median income of only $45,000 compared to the $72,000 of graduates with no postdoctoral intentions. This illustrates that an important earning gap exists between those who planned postdoctoral work and those who intended to enter directly into the labour market. Linking these two files shows that not taking into account those in postdoctoral positions results in an underestimation of earnings of doctoral graduates.

Chart 11

Median income of graduates in 2007 by postdoctoral intentions and field of study



Note: Excludes unpaid and self employed workers, respondents still taking education credits and those outside the labour force in 2007.

Sources: Statistics Canada, National Graduates Survey (Class of 2005) and Survey of Earned Doctorates, 2004/2005 and 2005/2006 linked file.

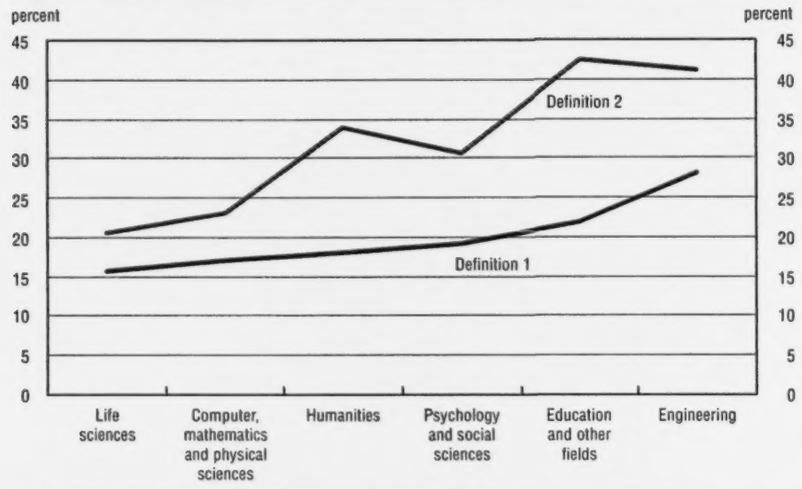
5.1 How are doctoral graduates employed?

Since doctoral education requires a large investment by the individual, often one that is matched by a similarly large investment by governments, it is important to know if these investments are worthwhile. Graduates' income is one indicator of how a society values certain skills. Another is the match or mismatch between the amount of education required for employment and education attained. Overqualified workers have made investments in human capital that have not yet been recognised or that were not necessary for the job held in 2007. Thus, overqualification may also be thought of as the underutilization of human capital by the economy, or alternatively, as an overinvestment in certain skills by the individual and governments.

Two definitions were used to identify overqualified individuals. The first is a self-reported indicator of whether or not the graduate felt overqualified for their current position. The second was derived by matching the respondent's educational attainment (i.e. doctorate degree) to the level of education they said was necessary to obtain the job. If less than a doctorate degree was required for their employment then they were classified as being overqualified. The results are displayed in Chart 12 below.

Chart 12

Proportion of graduates overqualified for current job, defined using 2 different definitions[1], by field of study



1. Definition 1 = subjective question, definition 2 = derived variable from job requirements to attainment.

Note: Excludes unpaid and self employed workers, respondents still taking education credits and those outside the labour force in 2007.

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Overall, and for each field of study, fewer employed graduates reported being overqualified (definition one) than reported needing less than a doctorate degree to obtain their job (definition two). Approximately one in five graduates (19%) said they were overqualified, compared to 30% who reported that less than a doctoral degree was needed to obtain the job they were in.

There were notable differences across fields of study. Engineering graduates were the most likely to indicate that they were overqualified for their position (28%), while graduates from education or other fields were the most likely to report that education below a doctorate was required for obtaining their job (43%). On both definitions, life science graduates were the least likely to be overqualified (16% and 21% respectively).

The largest difference between the two definitions was in education and other fields, where an additional 21% of graduates were classified as overqualified using the second definition, and in the humanities, where an additional 16% of graduates would be considered to be overqualified.

The underutilization of graduates had an impact on earnings as well. Employed graduates who reported being overqualified for their job (definition one) had a median income that was $5,000 lower than other graduates. Significant differences were observed between overqualified and non-overqualified graduates in psychology and social sciences ($5,000), the humanities ($17,000), and education and other fields of study ($14,000). Graduates from the life

sciences, engineering and computers, mathematics and physical sciences showed no difference in median income conditional on overqualification (Appendix table A.18).

The majority of graduates were employed in educational services

A different way of examining outcomes is to look at in which industries and occupations graduates are found. Examining employment by industry reveals that graduates were clustered in a small number of industry groups and that certain industries were more closely associated with specific fields of study.

The majority of graduates (56%) were employed in educational services; the vast majority of them working in a university (87%). Employment in the educational services was highest among humanities graduates (77%) and among graduates in education and other fields (76%). It was lowest among engineering graduates (34%).

The other industries that were large employers of doctoral graduates were professional, scientific and technical services (13%), health care and social assistance (13%), public administration (7%) and manufacturing (4%). No other industry accounted for more than 2% of employed graduates (see Appendix table A.19 for the complete list).

Industry of employment varied across the fields of study (Table 5). For instance, 13% of engineering graduates were employed in manufacturing and 28% of psychology and social science graduates were employed in health care and social assistance, though overall, these two industry sectors accounted for only 17% of all doctoral graduates in the class of 2005.

Table 5

Distribution of doctoral graduates by fields of study and industry of employment

Fields of study	Manufacturing	Professional, scientific and technical services	Educational services	Health care and social assistance	Public administration
			percent		
All fields of study	**4**	**13**	**56**	**13**	**7**
Life sciences	4	14	51	19	8
Engineering	13	31	34	x	9
Computers, mathematics and physical sciences	7	18	56	4	7
Psychology and social sciences	x	5	54	28	9
Humanities	x	4	77	2	3
Education and other fields	x	7	76	6	5

x suppressed to meet the confidentiality requirements of the *Statistics Act*

Note: Excludes unpaid workers, respondents still taking education credits and those outside the labour force.

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Section 6

Conclusions

This paper has highlighted several findings relevant for understanding recent doctoral graduating classes and for policy relevant research. Slightly more than a quarter of 2005 doctorate graduates (about 27%)[24] moved out of Canada upon completion of their degree and many still resided in the United States two years after graduation. However, 24% of those who moved to the United States after graduation in 2005 had returned to Canada by 2007, and many others were still planning to return. Previous research, (King, Eisl-Culkin and Desjardins, 2008), showed that moving to the United States is often linked to postdoctoral education. Perhaps this is why the life sciences accounted for such a large share of movers, since graduates from this field were the most likely to have plans for postdoctoral studies.

Data from the NGS show that doctoral graduates' employment outcomes vary across fields of study. Humanities graduates, for example, showed higher rates of both unemployment and part-time employment compared to graduates in other fields. However, those who were employed had a median income that was comparable to graduates from other fields of study.

Most graduates found employment in educational services, though graduates from some fields of study were found in a number of different industries. Engineering graduates were the most diverse, with significant proportions working in manufacturing, professional, scientific and technical services, and public administration as well.

The report shows that the skill set of doctorate graduates is not being fully utilized as nearly one third of graduates did not require a doctoral degree for the job they were currently doing. That being said, this finding applies to graduates only two years following graduation. It might be expected that with career progression, these doctorate holders may see the education-job skills match improve over time. This has implications for the economy and for the education choices that individuals are making.

Finally, this paper has shown that linking the SED and the NGS has increased the value of both of these surveys. The addition of information on postdoctoral education to the NGS helps to explain why there is not a larger difference observed in the incomes of master's and doctorate graduates two years after graduation. And data from the NGS has shown that graduates' expectations from SED are a poor approximation of actual outcomes as reported in the NGS, which in many cases, were better than expected. These findings are important for understanding previous research conducted with the SED and NGS and for continued improvements in education data.

Appendix

Standard tables

Table A.1
Characteristics of 2005 doctoral graduates who lived in Canada or the United States in 2007

	Proportion	Confidence limits (95%) Lower	Upper
	percent		
Distribution of all 2005 doctoral graduates within fields of study			
Life sciences	29	28	30
Engineering	13	12	14
Computer, mathematics and physical sciences	13	12	14
Psychology and social sciences	19	18	20
Humanities	12	11	13
Education and other fields of study	14	13	15
Distribution of men within fields of study			
Life sciences	27	26	28
Engineering	21	20	22
Computer, mathematics and physical sciences	17	16	18
Psychology and social sciences	13	12	14
Humanities	11	10	12
Education and other fields of study	11	10	12
Distribution of women within fields of study			
Life sciences	32	30	34
Engineering	5	4	6
Computer, mathematics and physical sciences	7	6	8
Psychology and social sciences	27	26	28
Humanities	12	11	13
Education and other fields of study	17	16	18

	Median age	Confidence limits (95%) Lower	Upper
	years		
Median age at the start of the doctoral program			
Life sciences	26	26	26
Engineering	28	28	28
Computer, mathematics and physical sciences	25	25	25
Psychology and social sciences	26	26	26
Humanities	28	27	29
Education and other fields of study	36	35	37
All fields of study	27	27	27
Median age at graduation			
Life sciences	31	31	31
Engineering	33	33	33
Computer, mathematics and physical sciences	30	30	30
Psychology and social sciences	33	33	33
Humanities	34	33	35
Education and other fields of study	42	41	43
All fields of study	33	33	33

Note: Percentages may not sum up to 100 due to rounding.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.2
Mother tongue of 2005 doctoral graduates by field of study and country of residence in 2007 for non-official language speakers

	Proportion	Confidence limits (95%) Lower	Upper
		percent	
English only			
All fields of study	**47**	**46**	**48**
Life sciences	46	44	48
Engineering	22	19	25
Computer, mathematics and physical sciences	45	42	48
Psychology and social sciences	53	51	55
Humanities	58	55	61
Education and other fields of study	58	55	61
French only			
All fields of study	**20**	**19**	**21**
Life sciences	24	22	26
Engineering	11	9	13
Computer, mathematics and physical sciences	15	13	17
Psychology and social sciences	25	23	27
Humanities	22	19	25
Education and other fields of study	17	15	19
Non-official language only			
All fields of study	**30**	**29**	**31**
Life sciences	28	26	30
Engineering	64	61	67
Computer, mathematics and physical sciences	37	34	40
Psychology and social sciences	20	18	22
Humanities	17	15	19
Education and other fields of study	22	19	25
English and French			
All fields of study	**1**	**1**	**1**
Life sciences	1 E	1	1
Engineering	x	...	...
Computer, mathematics and physical sciences	x	...	...
Psychology and social sciences	1 E	1	1
Humanities	x	...	...
Education and other fields of study	x	...	...
English or French, and non-official language			
All fields of study	**2**	**2**	**2**
Life sciences	2	1	3
Engineering	2 E	1	3
Computer, mathematics and physical sciences	2 E	1	3
Psychology and social sciences	1 E	1	1
Humanities	x	...	...
Education and other fields of study	2 E	1	3
Country of residence in 2007 for non-offical language speakers			
Chinese speakers			
Canada	81	77	85
United States	19	15	23
Other non-official language speakers			
Canada	87	85	89
United States	13	11	15

... not applicable
x suppressed to meet the confidentiality requirements of the *Statistics Act*
E use with caution

Note: Excludes respondents for whom the mother tongue is unknown.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.3
Characteristics of 2005 foreign-born doctoral graduates

	Proportion	Confidence limits (95%) Lower	Upper
		percent	
Proportion of foreign-born graduates by field of study			
All fields of study	**36**	**35**	**37**
Life sciences	30	28	32
Engineering	74	71	77
Computer, mathematics and physical sciences	44	41	47
Psychology and social sciences	24	22	26
Humanities	23	20	26
Education and other fields of study	31	28	34
Canadian citizens by naturalization, by field of study			
All fields of study	**70**	**68**	**72**
Life sciences	68	64	72
Engineering	74	71	77
Computer, mathematics and physical sciences	62	57	67
Psychology and social sciences	78	73	83
Humanities	67	61	73
Education and other fields of study	69	64	74
Landed immigrants by field of study			
All fields of study	**21**	**19**	**23**
Life sciences	23	20	26
Engineering	20	17	23
Computer, mathematics and physical sciences	24	20	28
Psychology and social sciences	16	12	20
Humanities	25	19	31
Education and other fields of study	20	16	24
Visa or foreign students by field of study			
All fields of study	**5**	**4**	**6**
Life sciences	6	4	8
Engineering	4 E	3	5
Computer, mathematics and physical sciences	5 E	3	7
Psychology and social sciences	x	...	...
Humanities	x	...	...
Education and other fields of study	5 E	2	8
Proportion who became landed immigrants before graduating from their program, by field of study[1]			
All fields of study	**69**	**65**	**73**
Life sciences	60	52	68
Engineering	62	54	70
Computer, mathematics and physical sciences	79	72	86
Psychology and social sciences	65	52	78
Humanities	76	65	87
Education and other fields of study	87	80	94

... not applicable
x suppressed to meet the confidentiality requirements of the *Statistics Act*
E use with caution

1. Excludes respondents for whom the date of immigration is unknown.

Note: Excludes respondents for whom the citizen status is unknown.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.4.1
2005 graduates who held a master's degree before enrolling in their doctoral program

	Proportion	Confidence limits (95%) Lower	Upper
		percent	
Graduate required a master's degree for admission to doctoral program			
All fields of study	**69**	**67**	**71**
Life sciences	50	46	54
Engineering	77	71	83
Computer, mathematics and physical sciences	57	51	63
Psychology and social sciences	76	72	80
Humanities	93	90	96
Education and other fields of study	86	81	91
Proportion of graduates with a master's degree before enrolment in doctoral program			
All fields of study	**80**	**79**	**81**
Life sciences	63	61	65
Engineering	85	83	87
Computer, mathematics and physical sciences	73	70	76
Psychology and social sciences	87	85	89
Humanities	95	93	97
Education and other fields of study	93	92	94

Sources: Statistics Canada, National Graduates Survey (Class of 2005) and Survey of Earned Doctorates, 2004/2005 and 2005/2006 linked file.

Table A.4.2
Median time interval between completing the master's degree and starting the doctorate program, by major activity

	Number of months	Confidence limits (95%) Lower	Upper
		median	
All master's degree holders	**4**	**3**	**5**
Going to school	1	1	1
Working	38	35	41
Working and going to school	3	2	4
Other	13 [E]	7	19

[E] use with caution

Sources: Statistics Canada, National Graduates Survey (Class of 2005) and Survey of Earned Doctorates, 2004/2005 and 2005/2006 linked file.

Table A.5
Main activity of 2005 doctoral graduates 12 months prior to enrollment in program, by field of study

	Proportion	Confidence limits (95%) Lower	Upper
		percent	
Going to school			
Life sciences	54	52	56
Engineering	45	42	48
Computer, mathematics and physical sciences	64	61	67
Psychology and social sciences	58	56	60
Humanities	54	51	57
Education and other fields of study	24	22	26
Working			
Life sciences	35	33	37
Engineering	48	45	51
Computer, mathematics and physical sciences	27	24	30
Psychology and social sciences	28	26	30
Humanities	34	31	37
Education and other fields of study	60	57	63
Working and going to school			
Life sciences	6	5	7
Engineering	4	3	5
Computer, mathematics and physical sciences	5	4	6
Psychology and social sciences	10	9	12
Humanities	7	6	8
Education and other fields of study	10	8	12
Other activity[1]			
Life sciences	5	4	6
Engineering	2 [E]	1	3
Computer, mathematics and physical sciences	3 [E]	2	4
Psychology and social sciences	5	4	6
Humanities	5	4	6
Education and other fields of study	6	4	8

[E] use with caution

1. Other activity includes: Taking care of family or household responsability, without work and looking for work and other.

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.6
Types of definite plans at graduation, 2005 doctoral graduates

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
All graduates			
Postdoctoral fellowship or other training or studies	**44**	**41**	**47**
Employment	**56**	**53**	**59**
Life sciences			
Postdoctoral fellowship or other training or studies	69	65	73
Employment	31	27	35
Engineering			
Postdoctoral fellowship or other training or studies	40	32	48
Employment	60	52	68
Computer, mathematics and physical sciences			
Postdoctoral fellowship or other training or studies	64	57	71
Employment	36	29	43
Psychology and social sciences			
Postdoctoral fellowship or other training or studies	30	25	35
Employment	70	65	75
Humanities			
Postdoctoral fellowship or other training or studies	24	17	31
Employment	76	69	83
Education and other fields of study			
Postdoctoral fellowship or other training or studies	7 [E]	3	11
Employment	93	90	96
Canadian born			
Postdoctoral fellowship or other training or studies	41	38	44
Employment	59	56	62
Foreign born			
Postdoctoral fellowship or other training or studies	49	44	54
Employment	51	46	56
Men			
Postdoctoral fellowship or other training or studies	48	44	52
Employment	52	48	56
Women			
Postdoctoral fellowship or other training or studies	39	35	43
Employment	61	57	65

[E] use with caution

Sources: National Graduates Survey (Class of 2005) and Survey of Earned Doctorates, 2004/2005 and 2005/2006 linked file.

Table A.7
2005 doctoral graduates who lived in Canada or the United States in 2007 by gender

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
All graduates			
Lived in Canada in 2007, did not moved to the United States after graduation	**84**	**83**	**85**
Moved to the United States after graduation, but lived in Canada in 2007	**4**	**4**	**4**
Lived in the United States in 2007	**12**	**11**	**13**
Men			
Lived in Canada in 2007, did not moved to the United States after graduation	82	81	83
Moved to the United States after graduation, but lived in Canada in 2007	4	3	5
Lived in the United States in 2007	14	13	15
Women			
Lived in Canada in 2007, did not moved to the United States after graduation	87	86	88
Moved to the United States after graduation, but lived in Canada in 2007	4	3	5
Lived in the United States in 2007	9	8	10

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.8.1
Characteristics of 2005 doctoral graduates who lived in the United States in 2007

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
Gender			
Male	63	59	67
Female	37	33	41
Marital status			
Married or common-law	68	64	72
Separated or divorced	2 [E]	1	3
Single, never married	30	26	34
Had dependent children	**31**	**27**	**35**
Citizenship status in 2007			
Canadian citizen by birth	59	55	63
Canadian citizen by naturalization	28	24	32
Landed immigrant or foreign student	6	4	8
No status in Canada or other	7	5	9
Proportion by field of study			
Life sciences	17	15	19
Engineering	11	9	13
Computer, mathematics and physical sciences	17	14	20
Psychology and social sciences	6	5	7
Humanities	9	7	11
Education and other fields of study	6	4	8

[E] use with caution

Note: Percentages may not sum up to 100 due to rounding.

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.8.2
Characteristics of 2005 doctoral graduates who lived in Canada in 2007

	Proportion	Confidence limits (95%) Lower	Upper
		percent	
Gender			
Male	53	52	54
Female	47	46	48
Marital status			
Married or common-law	74	73	75
Separated or divorced	4	4	4
Single, never married	22	21	23
Had dependent children	**47**	**46**	**48**
Citizenship status in 2007			
Canadian citizen by birth	65	64	66
Canadian citizen by naturalization	25	24	26
Landed immigrant or foreign student	10	9	11
No status in Canada or other	1	1	1
Proportion by field of study			
Life sciences	83	81	85
Engineering	89	87	91
Computer, mathematics and physical sciences	83	80	86
Psychology and social sciences	94	93	95
Humanities	91	89	93
Education and other fields of study	94	92	96

Note: Percentages may not sum up to 100 due to rounding.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.9.1
Aspects of the job which attracted the graduate to the United States, by gender

	Proportion	Confidence limits (95%) Lower	Upper
		percent	
Both sexes			
Quality of the research facilities / commitment to research	**35**	**30**	**40**
Greater availability of jobs in a particular / specialized field / industry	**27**	**23**	**31**
Better career advancement opportunities	**24**	**20**	**28**
Higher salary	**20**	**16**	**24**
Wanted to be where the action is / on the leading edge of a particular industry / field	**17**	**13**	**21**
Wanted to work with particular colleagues or superiors	**16**	**13**	**19**
Men			
Quality of the research facilities / commitment to research	35	29	41
Greater availability of jobs in a particular / specialized field / industry	26	21	31
Better career advancement opportunities	24	19	29
Higher salary	20	15	25
Wanted to be where the action is / on the leading edge of a particular industry / field	17	12	22
Wanted to work with particular colleagues or superiors	16	11	21
Women			
Quality of the research facilities / commitment to research	35	28	42
Greater availability of jobs in a particular / specialized field / industry	28	21	35
Better career advancement opportunities	24	18	30
Higher salary	19	13	25
Wanted to be where the action is / on the leading edge of a particular industry / field	15 [E]	10	20
Wanted to work with particular colleagues or superiors	18 [E]	12	24

[E] use with caution
Note: Percentages do not sum up to 100 since multiple responses were permitted.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.9.2
Education related factors which attracted the graduate to the United States, by gender

	Proportion	Confidence limits (95%) Lower	Upper
		percent	
Both sexes			
Quality of the research facilities / commitment to research	**33**	**24**	**42**
Wanted to study with particular colleagues or superiors	**26**	**18**	**34**
High academic reputation of the program / institution	**29**	**20**	**38**
Availability of program in a particular / specialized field	**20** [E]	**13**	**27**
Men			
Quality of the research facilities / commitment to research	37	26	48
Wanted to study with particular colleagues or superiors	24 [E]	14	34
High academic reputation of the program/ institution	23 [E]	13	33
Availability of program in a particular / specialized field	17 [E]	8	26
Women			
Quality of the research facilities / commitment to research	26 [E]	14	38
Wanted to study with particular colleagues or superiors	30 [E]	16	44
High academic reputation of the program/ institution	38 [E]	23	53
Availability of program in a particular / specialized field	23 [E]	11	35

[E] use with caution
Note: Percentages do not sum up to 100 since multiple responses were permitted.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.10
Graduates who had a job to start upon their arrival to the United States

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
Gender			
Men	93	90	96
Women	88	84	92
Fields of study			
All fields of study	**91**	**89**	**93**
Life sciences	95	93	97
Engineering	84	75	93
Computer, mathematics and physical sciences	98	96	100
Psychology and social sciences	89	81	97
Humanities	91	84	98
Education and other fields of study	68	53	83

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.11
Proportions of graduates who were employed in the 2007 survey reference week

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
Graduates living in the United States in 2007			
All fields of study	**92**	**90**	**94**
Life sciences	94	91	97
Engineering	91	85	97
Computer, mathematics and physical sciences	95	92	98
Psychology and social sciences	89	82	96
Humanities	83	73	93
Education and other fields of study	93	84	100
Gender			
Men	93	91	95
Women	90	86	94
Graduates living in Canada in 2007			
All fields of study	**89**	**88**	**90**
Life sciences	87	86	88
Engineering	89	87	91
Computer, mathematics and physical sciences	90	88	92
Psychology and social sciences	93	92	94
Humanities	79	75	83
Education and other fields of study	92	91	93
Gender			
Men	88	87	89
Women	89	88	90

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.12
Intention to return to Canada for doctoral graduates who lived in the United States in 2007

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
Intended to return to Canada			
All fields of study	**83**	**80**	**86**
Life sciences	84	79	89
Engineering	100	100	100
Computer, mathematics and physical sciences	75	66	84
Psychology and social sciences	81	70	92
Humanities	95	88	100
Education and other fields of study	53	36	70
Intended to return in 5 years or less			
All fields of study	**83**	**79**	**87**
Life sciences	89	84	94
Engineering	69	54	84
Computer, mathematics and physical sciences	92	85	99
Psychology and social sciences	89	81	97
Humanities	58	41	75
Education and other fields of study	62 [E]	40	84

[E] use with caution

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.13
Labour force activity of 2005 doctoral graduates in 2007 by field of study

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
All fields of study			
In education	**5**	**4**	**5**
Employed worker	**81**	**80**	**82**
Self-employed	**5**	**5**	**6**
Unemployed	**6**	**5**	**7**
Out of the labour force	**3**	**3**	**4**
Life sciences			
In education	9	8	10
Employed worker	80	79	82
Self-employed	3	2	4
Unemployed	4	3	5
Out of the labour force	4	3	5
Engineering			
In education	5	4	6
Employed worker	83	81	86
Self-employed	2 [E]	1	3
Unemployed	8	6	9
Out of the labour force	2 [E]	1	3
Computer, mathematics and physical sciences			
In education	2 [E]	1	3
Employed worker	87	85	89
Self-employed	2 [E]	1	3
Unemployed	5	4	7
Out of the labour force	3 [E]	2	5
Psychology and social sciences			
In education	3	2	4
Employed worker	80	78	82
Self-employed	10	9	11
Unemployed	5	4	6
Out of the labour force	2	1	3
Humanities			
In education	2 [E]	1	3
Employed worker	72	69	76
Self-employed	6	5	8
Unemployed	15	12	18
Out of the labour force	5	3	6
Education and other fields of study			
In education	3	2	4
Employed worker	81	79	84
Self-employed	9	7	10
Unemployed	3	2	4
Out of the labour force	4	3	5

[E] use with caution

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.14
Unemployment rate by field of study

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
All fields of study	**7**	**6**	**7**
Life sciences	5	4	6
Engineering	8	6	10
Computer, mathematics and physical sciences	6	4	7
Psychology and social sciences	5	4	7
Humanities	16	12	19
Education and other fields of study	3	2	4

Note: Excludes respondents who are still earning education credits.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.15
Rate of part-time employment by field of study

	Proportion	Confidence limits (95%)	
		Lower	Upper
		percent	
All fields of study	**8**	**7**	**9**
Life sciences	3	3	4
Engineering	2 [E]	1	3
Computer, mathematics and physical sciences	4	3	5
Psychology and social sciences	15	13	16
Humanities	18	13	22
Education and other fields of study	11	9	13

[E] use with caution

Note: Excludes respondents still earning education credits.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.16
Median income of graduates who were employed during the reference week in 2007, by field of study and gender

	Median income	Confidence limits (95%)	
		Lower	Upper
	dollars		
All fields of study			
Male	**65,000**	**64,480**	**65,520**
Female	**61,000**	**60,024**	**61,976**
Life sciences			
Male	49,462	47,484	51,440
Female	57,000	54,378	59,622
Engineering			
Male	70,000	68,180	71,820
Female	66,000	61,116	70,884
Computer, mathematics and physical sciences			
Male	60,000	57,600	62,400
Female	59,000	57,112	60,888
Psychology and social sciences			
Male	68,000	66,096	69,904
Female	61,000	59,536	62,464
Humanities			
Male	60,000	57,840	62,160
Female	56,000	54,320	57,680
Education and other fields of study			
Male	81,000	78,408	83,592
Female	73,000	71,394	74,606

Note: Excludes unpaid workers, respondents still taking education credits and those outside the labour force.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.17
Median income of Canadian and foreign-born graduates who were employed during the reference week in 2007, by field of study

	Median income	Confidence limits (95%)	
		Lower	Upper
	dollars		
All fields of study			
Canadian-born	**64,000**	**63,104**	**64,896**
Foreign-born	**60,000**	**58,920**	**61,080**
Life sciences			
Canadian-born	55,000	52,470	57,530
Foreign-born	50,000	46,600	53,400
Engineering			
Canadian-born	70,000	68,040	71,960
Foreign-born	69,892	67,935	71,849
Computer, mathematics and physical sciences			
Canadian-born	60,000	57,720	62,280
Foreign-born	60,000	57,000	63,000
Psychology and social sciences			
Canadian-born	65,000	63,830	66,170
Foreign-born	65,000	61,620	68,380
Humanities			
Canadian-born	58,000	56,376	59,624
Foreign-born	53,333	50,346	56,320
Education and other fields of study			
Canadian-born	78,000	75,816	80,184
Foreign-born	73,000	70,518	75,482

Note: Excludes unpaid workers, respondents still taking education credits and those outside the labour force.
Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.18
Median income of graduates who reported being overqualified[1] for their job in 2007, by field of study

	Median income	Confidence limits (95%)	
		Lower	Upper
	dollars		
All fields of study			
Not overqualified	**65,000**	**64,090**	**65,910**
Overqualified	**60,000**	**58,680**	**61,320**
Life sciences			
Not overqualified	53,000	50,456	55,544
Overqualified	55,000	51,150	58,850
Engineering			
Not overqualified	70,000	68,320	71,680
Overqualified	66,000	62,568	69,432
Computer, mathematics and physical sciences			
Not overqualified	60,000	58,200	61,800
Overqualified	60,000	57,240	62,760
Psychology and social sciences			
Not overqualified	65,000	63,440	66,560
Overqualified	60,000	57,000	63,000
Humanities			
Not overqualified	61,000	59,658	62,342
Overqualified	44,000	39,336	48,664
Education and other fields of study			
Not overqualified	79,600	78,167	81,033
Overqualified	65,000	62,010	67,990

1. Overqualified: definition based on the respondent's self identified perception.

Note: Excludes unpaid workers, respondents still taking education credits and those outside the labour force.

Source: Statistics Canada, National Graduates Survey (Class of 2005).

Table A.19
Industry of employment of 2005 doctoral graduates

	Proportion	Confidence limits (95%)	
		Lower	Upper
	percent		
Educational services	56	55	58
Professional, scientific and technical services	13	12	14
Health care and social assistance	13	12	13
Public administration	7	7	8
Manufacturing	4	3	4
Other services (except public administration)	2	1	2
Finance and Insurance	1	1	1
Information and cultural Industries	1	1	1
Wholesale trade	1	1	1
Arts, entertainment and recreation	1	1	1
Mining and oil and gas extraction	0.5	0.3	0.7
Retail trade	0.5	0.4	0.6
Utilities	0.3 E	0.2	0.4
Administrative and support	0.3 E	0.2	0.4
Construction	x	...	...
Agriculture, forestry	..	...	...
Real estate and rental and leasing	..	...	...
Management of companies and enterprises	..	...	...
Transportation and warehousing	x	...	...
Accommodation and food services	x	...	...

.. not available for a specific reference period

... not applicable

x suppressed to meet the confidentiality requirements of the *Statistics Act*

E use with caution

Note: Excludes unpaid workers, respondents still taking education credits and those outside the labour force.

Source: Statistics Canada, National Graduates Survey (Class of 2005).

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1. Statistics Canada, 2006 Census of Population, Statistics Canada Catalogue no. 97-560-XCB2006011
2. The number of graduates reported is from the Post-secondary Student Information System (PSIS), as cited in King, Eisl-Culkin and Desjardins (2008).
3. Fiegener, Mark K. *U.S. Doctorates Awarded Rise for Sixth Year, But Growth Slower*, Arlington, National Science Foundation, Info Brief, November 2009.
4. The graduation rate is calculated by the ratio of the number of graduates in a given year divided by the population at the typical age at graduation. See Statistics Canada, 2010. *Education Indicators in Canada: An International Perspective 2010.* Statistics Canada Catalogue no. 81-604-X. Ottawa. Statistics Canada and Council of Ministers of Education.
5. Doctorate programs vary across countries in length of program, so it is not clear that Level 6 of the International Standard Classification of Education (ISCED) is in fact comparing the same level of education. Other problems with measurement persist. See for instance Adelman, Clifford. 2009. "*The Spaces Between Numbers: Getting International Data on Higher Education Straight*". Washington, D. C., Institute for higher Education Policy, 59 p.
6. Auriol, Laudeline. 2010. *Careers of Doctorate Holders: Employment and Mobility Patterns.* Paris: OECD. 29 p. Science, Technology and Industry Working Paper Series, no. 2010/4.
7. Data from Statistics Canada, Postsecondary Student Information System (PSIS).
8. Council of Canadian Academies. 2009. *Innovation and Business Strategy: Why Canada Falls Short.* Ottawa, Council of Canadian Academies. 268p.
9. Note that the NGS excludes graduates who are no longer living in Canada or the United States in 2007
10. Out-of-scope doctoral graduates shared characteristics similar to those of 2005-2006 graduates who were planning to leave Canada upon graduation. Proportionally more out-of-scope doctorates were men, from the computer, mathematics and physical sciences and non-Canadian than was the case for the in-scope graduates. See: King, Darren, Judy Eisl-Culkin and Louise Desjardins. 2008. *Doctorate Education in Canada : Findings from the Survey of Earned Doctorates, 2005-2006.* Statistics Canada Catalogue no. 51-595MIE2008069. Ottawa, 75 p.
11. Taillon, Jacques and Mike Paju. 1999. *The Class of '95 : Report of the 1997 National Survey of 1995 Graduates.* Ottawa: Human Resources Development Canada, 19 p.
12. Chinese languages include : Mandarin, Cantonese, Hakka, Taiwanese, Chaochow (Teochow), Fukien and Shanghainese
13. Statistics Canada, 2006 Census of Population.
14. Includes visa students; however, these accounted for only 5% of all foreign-born graduates.
15. See for example: Knighton, Tamara and Sheba Mirza. 2002. "Postsecondary participation: the effects of parents' education and household income." *Education Quarterly Review.* Vol 8, no. 3: 25-32. Statistics Canada Catalogue No. 81-003-XPB2001.
16. Hoffer, T.B., M. Hess, V. Welch Jr., and K. Williams. 2007. *Doctorate Recipients from United States Universities: Summary Report 2006.* Chicago: National Opinion Research Centre, 203p.
17. Statistics Canada, National Graduates Survey (Class of 2005) and Survey of Earned Doctorates, 2004/2005 2005/2006 linked file.
18. King, Darren, Judy Eisl-Culkin and Louise Desjardins. 2008. *Doctoral Graduates in Canada: Findings from the Survey of Earned Doctorates, 2005/2006.* Statistics Canada Catalogue no. 51-595MIE2008069.

Ottawa. Statistics Canada and Human Resources and Social Development Canada, 75p.

19. 1997 data reported is from: Frank, Jeff and Éric Bélair. 1999. *South of the Border: Graduates from the Class of '95 who moved to the United States, an Analysis of Results from the Survey of 1995.* Statistics Canada Catalogue no.81-587-XPB. Ottawa. Statistics Canada and Human Resources Development Canada, 41 p.
20. 1995 graduates who had moved back to Canada by 1997 were not included in the *Survey of 1995 Graduates Who Moved to the United States*, conducted in 1999, but were included in the 1997 NGS. Therefore, the proportion of returnees to Canada in 1997 cannot be estimated.
21. Analysis by gender is not available due to the small sample.
22. Data from Statistics Canada, National Graduates Survey (Class of 2005) and Survey of Earned Doctorates, 2004/2005 and 2005/2006 linked file.
23. Bayard, Justin and Greenlee, Edith. 2010. *Graduating in Canada: Profile, Labour Market Outcomes and Student Debt of the Class of 2005.* Statistics Canada Catalogue no.81-595-MWE2009074, Ottawa, Statistics Canada and Human Resources and Skills Development Canada. 79 p.
24. See Box 1.

Culture, Tourism and the Centre for Education Statistics

Research Papers

Cumulative index

Statistics Canada's **Division of Culture, Tourism and the Centre for Education Statistics** develops surveys, provides statistics and conducts research and analysis relevant to current issues in its three areas of responsibility.

The **Culture Statistics Program** creates and disseminates timely and comprehensive information on the culture sector in Canada. The program manages a dozen regular census surveys and databanks to produce data that support policy decision and program management requirements. Issues include the economic impact of culture, the consumption of culture goods and services, government, personal and corporate spending on culture, the culture labour market, and international trade of culture goods and services. Analysis is also published in *Focus on Culture* (87-004-XIE, free, http://www.statcan.ca/bsolc/english/bsolc?catno=87-004-X).

The **Tourism Statistics Program** provides information on domestic and international tourism. The program covers the Canadian Travel Survey and the International Travel Survey. Together, these surveys shed light on the volume and characteristics of trips and travellers to, from and within Canada.

The **Centre for Education Statistics** develops and delivers a comprehensive program of pan-Canadian education statistics and analysis in order to support policy decisions and program management, and to ensure that accurate and relevant information concerning education is available to the Canadian public and to other educational stakeholders. The Centre conducts fifteen institutional and over ten household education surveys. Analysis is also published in *Education Matters* (81-004-XIE, free, http://www.statcan.ca/bsolc/english/bsolc?catno=81-004-X), and in the *Analytical Studies Branch research paper series* (11F0019MIE, free, http://www.statcan.ca/bsolc/english/bsolc?catno=11F0019M).

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81-595-M no. 002	Canadian education and training services abroad: the role of contracts funded by international financial institution
81-595-M No. 003	Finding their way: a profile of young Canadian graduates
81-595-M No. 004	Learning, earning and leaving – The relationship between working while in high school and dropping out
81-595-M No. 005	Linking provincial student assessments with national and international assessments
81-595-M No. 006	Who goes to post-secondary education and when: Pathways chosen by 20 year-olds
81-595-M No. 007	Access, persistence and financing: First results from the Postsecondary Education Participation Survey (PEPS)
81-595-M No. 008	The labour market impacts of adult education and training in Canada
81-595-M No. 009	Issues in the design of Canada's Adult Education and Training Survey
81-595-M No. 010	Planning and preparation: First results from the Survey of Approaches to Educational Planning (SAEP) 2002
81-595-M No. 011	A new understanding of postsecondary education in Canada: A discussion paper
81-595-M No. 012	Variation in literacy skills among Canadian provinces: Findings from the OECD PISA
81-595-M No. 013	Salaries and salary scales of full-time teaching staff at Canadian universities, 2001-2002: final report
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81-595-M No. 021	Canadian Framework for Culture Statistics
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81-595-M No. 028 Canadian School Libraries and Teacher-Librarians: Results from the 2003/04 Information and Communications Technologies in Schools Survey

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